DOCUMENT RESUME

ED 333 858 IR 015 019

AUTHOR Rice, Gary E.
TITLE Examining Constructs of Highlighting Using Two Modes: Paper versus Computer.
PUB DATE 3 Apr 91
NOTE 9p.; Paper presented at the Annual Conference of the American Educational Research Association (Chicago, IL, April 3-7, 1991).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Comparative Analysis; *Computer Assisted Testing; Higher Education; *Intermode Differences; Learning Theories; *Study Skills
IDENTIFIERS *Highlighting (Text); *Paper and Pencil Tests

ABSTRACT

This study examined the constructs of a study skill--highlighting--to determine whether the constructs for highlighting in a paper mode would be the same as highlighting in a computer mode. Constructs are defined as the underlying processes that are elicited in an experimental setting and that provide a basis for explaining the relations among the outcomes which are dependent upon subjects, stimulus materials, administration procedures, and scoring procedures and criteria. Two passages originally used by Messick (1989), one causal (rhetorical units) and one collection (idea units), were used in this experiment. The subjects, 120 undergraduate and graduate students (55% male and 45% female) enrolled in summer classes at a large university, were divided into four groups of 30. Two groups highlighted the causal type passage and two groups the collection type passage from either the computer or paper presentation. All four groups were administered the "Computer Readiness Index," and the two computer groups were given additional prior training to familiarize them with highlighting using the computer keyboard. A significant main effect was found for the paper presentation groups, who highlighted a significantly greater number of units than the computer groups. It is suggested that: (1) the computer groups may have had a more systematic approach to highlighting because of their prior training; (2) spreading-activation may have caused the subjects using pencil and marker to highlight clusters of units where the computer groups were more task-oriented; and (3) the use of highlighting text brings into play a different set of constructs when the material is presented via paper as compared to computer. (7 references) (BBM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED333858

Examining Constructs of Highlighting Using Two Modes: Paper Versus Computer

Gary E. Rice

The University of Texas at El Paso

Paper Presented at the

1991 American Education Research Association Annual Meeting

Chicago, Illinois

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Gary E. Rice

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

12015019

Examining Constructs of Highlighting Using Two Modes: Paper Versus Computer

Gary E. Rice
Education 205
The University of Texas-El Paso
El Paso, TX 79968

Computers as a mode of presentation of text for instruction in study skills have received much attention from researchers and practitioners. An assumption of this delivery system is that the constructs underlying study skills instruction taught using paper presentation mode are the same as those taught by computer mode. A question which remains, however, is whether or not this assumption is valid. Instead of examining this particular issue per se, researchers have investigated artifactual dimensions of the two media (e.g., reading speed; effects of glare on visual perception of letter characters; and posture of presentation materials). In light of this little understood question, the purpose of this study was to examine the constructs of a study skill, highlighting, as they transpire under two text presentation modes (paper versus computer).

The importance of this issue is that there is a research base for the use of highlighting. Moreover, teachers have traditionally used markers and paper as the mode for instruction in study skills. As computers become more prevalent in the classroom, the question is whether the constructs for highlighting in a paper mode would be the same as highlighting in a computer mode. If study skills are to be used on computer, a question may be whether or not the study skills are the same when using the computer. If the constructs are similar using an on-line measure, then study skills are quite likely the same for highlighting in a paper mode. If the constructs are different, then those differences must be considered in light of instructional implications as well as for future research.

For this study, Messick's (1989) definition of constructs was used. Constructs can be described as the underlying processes that are elicited in an experimental setting and that provide a basis for explaining the relations among the outcomes which are dependent upon subjects, stimulus materials, administration procedures, and scoring procedures and criteria (Messick, 1989). Constructs provide clarity for the unobservable (i.e., highlighting processes) and allow those relations to become evident and, hence, discussed and interpreted in meaningful ways. Constructs provide for theory to be interpreted by providing an explanation (underlying processes) of how operational conditions determine that a certain set of responses, measured in a certain manner, and arrayed in a particular fashion will

occur. The theory posits, through a set of hypotheses or predictions, how the data will be arrayed given a determined operational condition.

Meyer's (1975) theory of comprehension was used to identify constructs of highlighting. Meyer's theory basically argues that when readers process information, they tend to identify more superordinate ideas than subordinate ideas from text. The content structure of the text is organized in a hierarchical order with rhetorical units located at the top level of the structure and related idea units located in a downward path from the superordinate ideas. The constructs that Meyer uses to explain these findings is that pathways are established through certain types of text that determine how information in memory is stored and retrieved. One manner of presentation for an on-line measure, as it relates to Meyer's constructs, is to use highlighting or underlining (Alvermann, 1982). As the reader highlights or underlines, decisions of what is important relating to the text's hierarchy or location of superordinate and subordinate information are made concurrently with the reading act. However, what Meyer had not investigated was if these constructs were evident in terms of a useful study skill, such as highlighting. While the use of computer technology may be an important advancement, it is unclear whether the computer mode alters or changes underlying processes of highlighting. An unanswered question is, "Are constructs of comprehension using paper the same as computer presentation using highlighting procedures?" This was the central question addressed in this experiment.

This experiment replicated several aspects of a study by Meyer and Freedle (1984) using the same passages and scoring criteria. In their study, Meyer and Freedle found that subjects identified more information from the causal type passage than the collection type passage. The causal type passage relates an antecedent condition to its consequent, and the collection type passage relates a series of attributes to an idea or event. The difference between this experiment and Meyer and Freedle's study was using highlighting procedures and the inclusion of computer presentation of text.

Methods

One-hundred-and-twenty undergraduate and graduate students enrolled in classes during the summer program at a large university were selected to participate in this experiment. Of the partici-

pants, 55% were male and 45% were female. The subjects participated in four groups of 30. Two of the groups highlighted the causal type passage from either computer presentation or paper presentation, and two of the groups highlighted the collection type passage from either computer presentation or paper presentation. To control for differences in attitudes and experience that might result from the use of a relatively novel mode of instruction (computers), all of the participants completed the Computer Readiness Index (CRI) (Boeshaar, 1986).

Two passages (causal and collection) used by Meyer and Freedle (1984) in a previous study were used in this experiment. The passages were about athlete's loss of body water. Rhetorical units included loss of body water required by coaches to attain a specified weight and the resulting physical impairments from this loss of water. Idea units included descriptions of specific amounts of body water loss, such as three percent loss impairs physical performance and five percent loss results in heat exhaustion.

In the computer presentation mode, passages (collection and causal) were randomly installed on each computer prior to the subjects arriving at the computer site. The Computer Readiness Index was also placed at each computer station. Additionally, there was a practice passage included for training in using the computer for highlighting. When subjects entered the computer room, they were assigned a computer station with either the causal or collection passage installed. Subjects were asked to be seated at the computer as they entered the room from the front of the room towards the back so as to fill the first rows, then the second, etc. There was no indication on either the computer screen or at the computer station to indicate which passage type was installed.

The paper mode of presentation was administered to the subjects in their classroom at the beginning of the regular class time. The two passage types (causal and collection) were merged in a random fashion by mixing them with one another several days prior to administration. The passages were placed face down on each desk in the classroom prior to subjects entering the test area. The Computer Readiness Index was placed on top of each passage. As subjects entered the classroom, they were asked to be seated from the front of the room to the back and not to turn over the paper on the desk. The experiment took approximately 30-45.

Highlighting protocols from a particular passage were scored with the aid of the passage's content structure. Both the causal and collection passages were parsed according to Meyer's grammar (Meyer, 1975). This parsing required the rhetorical units and idea units to be identified and displayed to show the relationships between and among various linguistic constituents. From the parsed passages, scoring templates were created which allowed for a ratio between the idea units and rhetorical units.

Protocols were scored for the presence or absence of ratio of the 58 idea units and 11 rhetorical units in the content structures of the two types of passages. Meyer and Freedle previously used this scoring procedure and found over 99% agreement between two independent scorers (Meyer & Freedle, 1984). For this experiment, there was 98% agreement in scoring the ratio of idea units to rhetorical units highlighted between the experimenter and two graduate students who were instructed in Meyer's (1975) prose analysis.

Results

Prior to analysis, an arc sine transformation was used to normalize the data. A 2 (Rhetorical Type) X 2 (Presentation Mode) Analysis of Variance (ANOVA) was used to test the differences between means for the ratio of rhetorical units to idea units. Nonsignificant results were found for Rhetorical Type [$F(1,116) = 1.65$, $p = .20$] and Type by Mode [$F(1,116) = 0.30$, $p = .59$]. There appeared to be no difference between the causal and collection passage in terms units highlighted or units highlighted by computer versus paper and marker. In an analysis by Mode, a significant main effect was found [$F(1,116) = 13.27$, $p = .0004$]. A Tukey Studentized Range (HSD) post-hoc comparison at $p<.05$ revealed a significantly greater number of rhetorical units to idea units highlighted in the paper presentation than by computer presentation of text. This suggests that readers highlighted more important units in paper mode than in computer mode.

No differences were noted between passage type (causal versus collection). These results are different than those found in other studies using Meyer's procedures. A significantly greater number of rhetorical units to idea units were highlighted in paper mode versus computer mode. These findings

suggest that when highlighting information on paper versus computer, different constructs appear to be functioning.

Discussion

The question of this study was, Are constructs of comprehension using paper presentation the same as computer presentation using highlighting procedures? A significant main effect was found for Mode where a significantly greater number of units were highlighted in the paper presentation than the computer presentation of text. No significant results were found for Rhetorical Type, or Type by Mode.

At this stage, it is not possible to identify specific constructs for those differences as they relate to Meyer's constructs. It would be expected under Meyer's constructs that there would be a difference by Rhetorical Type. Her constructs suggest that the causal passage would be highlighted better due to selective attention to the causal rhetorical structures than to the collection rhetorical structures. Possibly, the differences found by Mode were due to subjects in the paper-and-marker mode perseverating and marking text. Whereas, those subjects in the computer mode were able to attend more to the task.

Another alternative explanation might be attributed to the administration procedures. Individuals in the computer mode may have highlighted less information due to the higher structure placed on the task. For example, those in the computer mode were provided two additional passages (e.g., the practice passage and mastery passage) with specific instructions to highlight individual words and small groups of words. By providing training in how to use the computer to highlight, and providing examples of information which to highlight, subjects may have highlighted fewer or more discrete units. While, the training component of the experiment included words as well as phrases to highlight, the computer group received additional experience with the task than did the paper and marker group.

The purpose of presenting these additional passages was to provide training in using the keyboard of the computer. In so doing, subjects may have also been "trained" to highlight more specific information and not large groups of words giving them a lower overall ratio. In the paper-and-marker condition, subjects did not receive additional practice passages and possibly highlighted information in

a less systematic manner. This may have led to those subjects highlighting more groups of words and phrases rather than particular words giving them a higher overall ratio due to the greater chances of including more units.

Perhaps a different perspective of looking at Meyer's theory would be through the theory of spreading-activation (Bobrow & Collins, 1975; Collins & Loftus, 1975). It was noted during the highlighting of text on paper, that clusters of words were usually highlighted around the idea units but not the rhetorical units. The spreading-activation theory suggests that information in memory is stored through an intricate network of concepts or semantic-memory networks. Consequently, when subjects were highlighting information using paper-and-marker, it may be that spreading-activation caused them to highlight clusters of units where the computer groups were more task-directed and spreading-activation was not operating. Subjects in the computer mode were more directed to particular idea units and were not mentally focused on the clusters of units, consequently fewer units were highlighted.

The results of this experiment suggest that the use of highlighting text brings into play a different set of constructs when the material is presented via paper as compared to computer. As was suggested in the discussion of constructs, explanations and interpretations are limited to the identification of mental processes that operational criteria evoke. Given this proposition, it would be inappropriate and presumptive to suggest that highlighting expository text on computer requires the same processes as does highlighting on paper.

References

Alvermann, D. (1982). Restructuring text facilitates written recall of main ideas. Journal of Reading, 754-758.

Bobrow, D. G., & Collins, A. (Eds). (1975). Representation and understanding. New York: Academic Press.

Boeshaar, D. (1986). Computer Readiness Index (CRI). Unpublished manuscript.

Collins, A. M., Loftus, E. F. (1975). A spreading activation theory of semantic processing. Psychological Review, 82, 407-428.

Messick, S. (1989). Validity. In R. L. Linn (Ed.), Educational measurement (3rd ed., pp. 13-104). New York: Macmillan.

Meyer, B. J. F. (1975). The organization of prose and its effects on memory. Amsterdam: North-Holland Publishing Company.

Meyer, B. J. F. & Freedle, R. O. (1984). Effects of discourse type on recall. American Educational Research Journal, 21, 121-143.